



(SEE NOTE 4)

REV.	DATE	APPR.	DESCRIPTION	BY
DESIGNED: KA			U.S. COAST GUARD	HEADQUARTERS
DRAWN: KA			OCEAN ENGINEERING	
TRACED:			CAT III (12VDC) ATON PWR-	
CHECKED:			SUPPLY/VRB-25 LTHSE SYS	
REVIEWED BY:			(Solar Back-Up - D14 Std)	
KA				
PROJECT ENGINEER				
REVIEWED BY:				
JTG				
G-SEC-2A				
REVIEWED BY:		APPROVED:	H. R. CLEVELAND	DATE 11/30/04
		CHIEF OF DIVISION		
UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS ARE IN INCHES. TOLERANCES: DIM. ANG.			DRAWING NUMBER 130430	REV.
		SCALE: NONE	SHEET 1 OF 2	

Theory of Operation:

This simplified Category III lighthouse system is designed to provide a reliable light signal to the mariner by offering an independent solar powered backup light system. Under normal conditions when commercial power is available, the VRB-25 main light is enabled and powered by the standard high-watt AtoN power supply (HWPS). As long as commercial power and the main light have not failed, the SACII will keep the system in the primary (that is, normal) mode of operation with the main light enabled (and on, if at night) and the emergency light disabled.

During this primary mode of operation, the backup solar power circuit, comprised of the 20W solar panel and 100AH battery, remains in standby mode. To keep the battery from overcharging and the system in balance during standby a small amount of battery energy must be dissipated daily. To achieve this charge balance a constant 120 mA current (or 2.88 AH per day) is intentionally dumped into the Solar Load Resistor R1.

In the event of failure of the VRB-25 to draw current (e.g., lamp failure) or rotate (e.g., motor failure), the SACII will release relay K1 after a delay of about 100 seconds, which will enable the emergency light. If there is a commercial power failure, K1 will release right away. Since the emergency light is enabled/disabled with the application/removal of 12VDC power via K1, and not by a control wire from the SACII (as is the case in a standard Category I Solar Lighthouse), the emergency light uses a separate photoresistor (type C DLC) to control its independent on/off operation.

The solar power system is designed to power the emergency light indefinitely, even though the most common failure mode of the main light (commercial power outage) is likely to last for only a short period of time. The solar power system design is based on a 2.03A lamp operated at a 10% duty cycle for 12 hours per day during emergency operation. This load profile consumes 2.436 AH per day while operating. For any D14 location, a single 100AH battery and a 20W solar panel tilted 60° from horizontal will support this load (that is, the emergency light) indefinitely.

Upon power restoration after a commercial power outage, the HWPS re-energizes and restores power to the SACII. The SACII then automatically resets, assumes primary mode, and begins normal ops. A SACII-reset serves to bring the main light back online and simultaneously actuate (energize) K1 to disable the emergency light. The function of resistor R2 is to bleed off any stray charge that remains in the output stage of the power supply during a commercial power outage to ensure that the SACII can successfully reset the system.

In order for the 12VDC 100W main light lamp to operate at the luminous intensity required to meet the advertised signal range, the output voltage of the power supply must be manually adjusted (increased) such that the measured voltage at the HW Lampchanger is exactly 12.0VDC (see note 5). Although the HWPS's factory setting is 12.5VDC, it's unrealistic to assume that a voltage loss of only 0.5VDC (or less) will be realized between the power supply and the main light.

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			130430	
SCALE: NONE			SHEET 2	OF 2